

DOCUMENTED CHROMOSOME NUMBERS 1993:3 MISCELLANEOUS U.S.A. AND MEXICAN SPECIES, MOSTLY ASTERACEAE

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ABSTRACT

Chromosome counts are reported for 100 collections of flowering plants representing 81 species from the U.S.A., Mexico, Ecuador, and Guatemala: 71 species of Asteraceae, representing 44 genera; 3 species of *Phacelia* (Hydrophyllaceae); 3 species of *Physalis* (Solanaceae); 2 species of *Brazoria* (Lamiaceae); 1 species of *Gilia* (Polemoniaceae); and 1 species of *Gibasis* (Commelinaceae).

The following chromosome counts (Table 1) are documented by specimens deposited at the University of Texas, Austin (TEX). Previously uncounted taxa are represented by an asterisk (*). A double asterisk (**) indicates a new number for the species. Federov (1969) and the standard indices of plant chromosome numbers published since that opus (through 1989; cf. introduction, Goldblatt and Johnson 1991) were consulted to ascertain previous counts for the taxa concerned.

METHODS

Chromosome counts were made from bud material collected in the field and fixed in a modified Carnoy's solution (4:3:1; chloroform, absolute ethanol, glacial acetic acid), using standard squash procedures. A single count of *Chaetopappa effusa* (N 7521) was made from somatic cells of meiotic material.

DISCUSSION

The white-headed *Chaenactis fremontii* has been well-documented as having meiotic chromosome counts of $n=5$ pairs. Such counts presumably derived by aneuploid loss from $n=6$ pairs in the yellow-headed *C. glabriuscula* (Kyhos, 1965). Our count of $n=6$ pairs for *C. fremontii* was obtained from a plant growing at the together with *C. stevioides* (within an area of ca 500 square meters), the latter having a count of $n=5$ pairs. Kyhos (1965) noted that *C. stevioides* and *C. fremontii* only rarely occur together, and that "Within these few local areas of sympatry the distinctiveness of the species is still maintained even though hybridization between them is sometimes frequent." We did not note hybrids between these at the site concerned, but we do believe that our meiotic count for *C. stevioides* was

TABLE 1. Chromosome numbers

Family/Species	Voucher	Chromosome number (2n)
Asteraceae		
<i>Ageratum conyzoides</i> L. var. <i>conyzoides</i>	MEX ¹ Jalisco:M ² 1635	40
<i>Ageratum conyzoides</i> var. <i>latifolium</i> (Cav.) Johnson	ECU Pastaza:D 6050	ca 40
<i>Alloispermum scabrum</i> (Lag.) H. Rob.	MEX Chiapas:S 3132	32
<i>Aphanostephus riddellii</i> T. & G.	USA Texas:N 7341	10
<i>Aphanostephus skirrhobasis</i> (DC.)Trel. var <i>skirrhobasis</i>	USA Texas:N 7342	6
<i>Aphanostephus skirrhobasis</i> var. <i>thalassius</i> Shinnery	USA Texas:N 7556	6
<i>Arnica foliosa</i> Nutt.	USA California:Z 907	38
<i>Baileya multiradiata</i> Harv. & Gray	USA Arizona:S 3251, 3252	32
<i>Brickellia paniculata</i> ((Mill.) B.L. Rob.	MEX Chiapas:P 1140	18
<i>Chaenactis carphodilia</i> A. Gray	USA California:T 92-2	16
<i>Chaenactis douglasii</i> (Hook.) Hook. & Arn.	USA California:Z 904	12
** <i>Chaenactis fremontii</i> A. Gray	USA California:T 92-17	12
<i>Chaenactis stevioides</i> Hook. & Arn.	USA California:T 92-20	10
* <i>Chaetopappa bellidifolia</i> (Gray & Engelm) Shinnery	USA Texas:N 7298	16
<i>Chaetopappa bellioides</i> (A. Gray) Shinnery	MEX Nuevo Leon:M 1694	16
* <i>Chaetopappa effusa</i> (A. Gray) Shinnery	USA Texas:N 7521	16 ³
* <i>Chaetopappa effusa</i> (A. Gray) Shinnery	USA Texas:N 7510	16
* <i>Chaetopappa parryi</i> (A. Gray)	MEX Coahuila:N 7413	16
* <i>Coreopsis palidosa</i> M.E. Jones	MEX Durango:S 3467	24
<i>Dichaetophora campestris</i> A. Gray	MEX Nuevo Leon:N 7552	6
<i>Encelia frutescens</i> A. Gray	USA California:T 92-18	36
* <i>Erigeron bigelovii</i> A. Gray	USA New Mexico:W 20870	36
* <i>Erigeron chiangii</i> var. <i>lamprocaulis</i> Nesom	MEX Coahuila:N 7408	ca 36
<i>Erigeron divergens</i> T. & G.	USA Texas:W 20401	4-7 II+ 19-13 uni
<i>Erigeron divergens</i> T. & G.	USA New Mexico W 20871	36 uni
<i>Erigeron divergens</i> T. & G.	USA New Mexico:W 20899	27 uni
* <i>Erigeron metrius</i> Blake	MEX Coahuila:N 7410	54
<i>Erigeron modestus</i> A. Gray	MEX Coahuila:N 7407a	36
<i>Erigeron modestus</i> A. Gray	MEX Coahuila:T 93-134	27 uni
<i>Erigeron tenuis</i> T. & G.	USA Texas:N 7574	18
<i>Erigeron tenuis</i> T. & G.	USA Texas:N 7561	18
<i>Erigeron turnerorum</i> Nesom	MEX Nuevo Leon:N 7538	18
** <i>Eriophyllum lanosum</i> (A. Gray) A. Gray	USA California:T 92-19	10 (ring of 4 + 3 pairs)
<i>Fleischmannia obscurifolia</i> (Hieron.) K. & R.	ECU Napo:D 6206	40
<i>Flyriella parryi</i> (A. Gray) K. & R.	MEX Coahuila:N 7416	20
<i>Gaillardia multiceps</i> Greene	USA Texas:T 93-5	68
<i>Grindelia grandiflora</i> Hook.	MEX Coahuila:N 7456	12
* <i>Grindelia pusilla</i> (Steyerm.) Nesom	USA Texas:N 7352,7531	12
<i>Heterotheca</i> sp.	USA New Mexico:T 93-18	18
* <i>Heterotheca gypsophila</i> B.L. Turner	MEX Nuevo Leon:T 93-157	36
<i>Heterotheca subaxillaris</i> (Lam.) Britt. & Rusby.	MEX Nuevo Leon:T 93-155	18
<i>Hydropectis aquatica</i> (Watson) Rydb.	MEX Durango:S 2790	18
<i>Hymenothrix wislizeni</i> A. Gray	USA New Mexico:Z 893	24
<i>Hymenothrix loomisii</i> Blake	USA Arizona:Z 909	48

TABLE 1. Chromosome numbers (continued)

Family/Species	Voucher	Chromosome number (2n)
* <i>Jaegeria purpurascens</i> B.L. Rob.	MEX Durango:S 2788, 2797	18
* <i>Jaegeria glabra</i> Rydb. var. <i>glabra</i>	MEX Durango:S 3451	18
<i>Lagascea helianthifolia</i> HBK	MEX Jalisco:M 1638	34
<i>Malacothrix glabrata</i> A. Gray	USA California:T 92-22	14
<i>Melanthera nivea</i> (L.) Small	MEX Oaxaca:M 956	30
<i>Monoptilon belliioides</i> (A. Gray) Hall	USA California:T 92-1	16
<i>Pectis papposa</i> Harv. & Gray var. <i>papposa</i>	MEX Chihuahua:S 3441	24
<i>Perityle emoryi</i> Torr.	USA California:T 92-5	102
* <i>Perymenium cualense</i> B.L. Turner	MEX Jalisco:M 1642	60
* <i>Porophyllum zimapanum</i> B.L. Turner	MEX Hidalgo:LW 399	24
<i>Psilostrophe tagetina</i> (Nutt.) Greene	USA Texas:Z 899	32
<i>Senecio flaccidus</i> var. <i>douglasii</i> (DC.) B.L. Turner & Barkley	USA California:Z 899	ca 40
<i>Senecio (Roldana) grandifolius</i> Less.	MEX Chiapas:L 217	60+(6-8 frag.)
* <i>Senecio (Roldana) heterogama</i> Hemsl.	MEX Chiapas:S 3131	60
* <i>Senecio (Roldana) sessilifolius</i> Hemsl.	MEX Durango:S 2807	60
<i>Solidago altissima</i> L.	USA Texas:N 7503, 7507, 7509	36
<i>Solidago altissima</i> L.	USA Texas:N 7505	ca 36
<i>Solidago altissima</i> L.	USA Texas:N 7508	ca 36
<i>Solidago sempervirens</i> L.	USA Texas:N 7504	36
<i>Stenocarpa filiformis</i> (Hemsl.) Blake	MEX Sinaloa:M 1664	16
<i>Stevia salicifolia</i> Cav. var. <i>salicifolia</i>	MEX Chihuahua:S 3365	24
* <i>Tagetes lunulata</i> Ort.	MEX Durango:S 3468	24
* <i>Tagetes mulleri</i> Blake	MEX Nuevo Leon:S 3296	24
<i>Tagetes zypaquierensis</i> HBK	ECU:JP 2901	24
<i>Thelesperma simplicifolia</i> var <i>macrocarpum</i> Melchert	MEX Nuevo Leon:T 93-150	60
<i>Townsendia annua</i> Beaman	USA New Mexico:W 20431	18
<i>Trichoptilium incisum</i> A. Gray	USA California:T 92-9	26
<i>Tridax coronopifolia</i> HBK	MEX Hidalgo:LW 396, 398	18
<i>Verbesina crocata</i> (Cav.) Less.	MEX Guerrero:P 1194	34
<i>Verbesina microptera</i> DC.	MEX Nuevo Leon:P 1297	34
* <i>Verbesina robinsonii</i> Fern.	MEX Hidalgo:LW 407	34
<i>Vernonia oaxacana</i> Schultz-Bip.	MEX Chiapas:P 1085	34
<i>Viguiera parishii</i> Greene	USA California:T 92-113	36
* <i>Wedelia scabra</i> B.L. Turner	MEX Jalisco:M 1634	24
* <i>Wedelia talpana</i> B.L. Turner	MEX Jalisco:M 1640	24
<i>Xylorhiza tortifolia</i> (T. & G.) Greene	USA California:T 92-11	12
Commelinaceae		
<i>Gibasis venustula</i> (HBK) D.Hunt	MEX Coahuila:T 93-137	12
Hydrophyllaceae		
<i>Phacelia campanularia</i> ssp. <i>variformis</i> Gillett	USA California:T 92-14	22
* <i>Phacelia crenulata</i> Torr. var. <i>crenulata</i>	USA California:T 92-18	24
** <i>Phacelia distans</i> Benth.	USA California:T 92-21	24
Lamiaceae		
<i>Brazoria truncata</i> (Benth.) Engelm. & Gray	USA Texas:MT 14, 15, 17, 18	28
<i>Brazoria scutellarioides</i> Engelm. & Gray	USA Texas:MT 20	20
Polemoniaceae		
* <i>Gilia purpusii</i> Brand	MEX Nuevo Leon:T 93-154	18

TABLE 1. Chromosome numbers (continued)

Family/Species	Voucher	Chromosome number (2n)
Solanaceae		
* <i>Physalis gracilis</i> Miers	GUA Izabal:MM 1919	24
<i>Physalis bедераefolia</i> A. Gray	MEX Oaxaca:MM 1903	24
** <i>Physalis bедераefolia</i> A. Gray	USA Texas: MM 1949	24 & 48
* <i>Physalis melanocystic</i> Bitter	MEX Tamaulipas:MM 1940	24

¹ Abbreviations for countries are ECU=Ecuador, GUA=Guatemala, MEX=Mexico, and USA=United States.
² Letters before collection numbers pertain to the following collectors:D(Piero Deleprete); L(Alice LeDuc); M(Mark Mayfield); MM(Mahinda Martinez); N(Guy Nesom); P(Alan Prather); JP(Jose Panero); S(Jacqui Soule); T(B. Turner); MT (Matt Turner); W (Richard Worthington); LW (Lindsay Woodruff); Z(Zai-Ming Zhao).
³ Counted from somatic cells.

correctly determined as n=6 pairs, although it is possible that our count was complicated by irregularities connected with hybridization between these two taxa at this site.

The counts for *Chaetopappa bellidifolia*, *C. effusa*, and *C. parryi* are first reports for each of the species (a previous report for *C. bellidifolia* was in error; see comments in Nesom 1992). With the addition of these counts, 9 species of the genus (of the total 11) are now known to have a base number of x=8. Previous reports of species with x=9 have been erroneous, based largely on misidentifications (Nesom 1992).

The triploid and tetraploid plants identified here as *Erigeron divergens* (collected by Worthington: W 20401, El Paso, Co.; W 20871, Dona Ana Co., New Mexico; W 20899, Dona Ana Co., New Mexico) have woody bases and are clearly perennial, in contrast to more typical forms of the species over most of its range. The irregular meiotic pairing of these plants is reflected in the production of highly sterile pollen, and the successful production of fertile achenes implies that they are almost certainly apomictic. *Erigeron modestus* is probably involved in their parentage (Nesom, pers. comm.). Particularly in this general area (southwest Texas, adjacent New Mexico, and into north-central Mexico), there is a complex of populations with intermediates combining features of *E. divergens*, *E. metrius*, *E. modestus*, *E. flagellaris* A. Gray, and *E. colomexicanus* A. Nelson. The Coahuilan collections of *Erigeron* by Nesom (7407a and 7410) were from a locality where these five species grow in close proximity, with identifiable hybrids in almost every possible combination among them.

The chromosome number of *Erigeron turnerorum* was first reported as n=9 by Turner (1978), who identified it as *E. tenellus* DC., which is closely related.

Previous counts for the mostly white-rayed *Eriophyllum lanosum* have been reported as n=4 (with n=5 for the closely related, mostly yellow-rayed *E. wallacei*).

We interpret our meiotic count as being $n=3$ II and a ring of 4, hence our suggestion that the count is basically $n=5$, as occurs in *E. wallacei* (A. Gray) A. Gray, although it is possible that the count is $n=4$ pairs (3 bivalents and 1 large bivalent about twice the size of the other 3). Our material certainly represents *E. lanosum*, since it has white rays and was collected in a region well within the range of that taxon. (ca. 1 mile south of Needles, California, along highway 95).

The five counts at the tetraploid level for *Solidago altissima* (= *S. canadensis* var. *scabra* Torr. & Gray) were made from plants obtained in southeastern Texas from the same general area that previously reported collections and counts were made (Turner and Zhao 1992). The present counts were made from Brazos Co. (N 7505 and N 7507), Washington Co. (N 7508), and Lee Co. (N 7509). Except for their slightly smaller heads, these plants are nearly identical to the widespread hexaploid plants of *S. altissima*, but their tetraploid condition supports their recognition as *S. altissima* var. *pluricephala* M.C. Johnston. This tetraploid race was almost certainly formed independently of other tetraploids within the *S. canadensis* complex, which are widely separated both geographically and morphologically (Nesom pers. comm.).

Thelesperma simplicifolia var. *macrocarpum* Melchert (1990) has called attention to the hexaploid ($2n=60$) nature of this recently described taxon; counts for the var. *simplicifolia* have been $2n=20, 22, 24$ or 40 .

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REFERENCES

- FEDOROV, A.A. (ed.) 1969. Chromosome numbers of flowering plants. Acad. Sci. U.S.S.R., Moscow. Goldblatt, P. and D.E. Johnson. 1991. Index to plant chromosome numbers 1988-1989. Missouri Botanical Garden. St. Louis.
- KYHOS, D.W. 1965. The independent aneuploid origin of two species of *Chaenactis* (Compositae) from a common ancestor. *Evolution* 19:26-43.
- NESOM, G.L. 1992. Transfer of *Chaetopappa elegans* to *Ionactis* (Asteraceae: Astereae). *Phytologia* 73: 416-424.
- TURNER, B.L. 1978. In IOPB Chromosome number reports LXII. *Taxon* 27:519-535.
- TURNER, B.L. and ZHAO, Z. 1992. Documented chromosome numbers 1992:2. *Sida* 15:147-150.